

### Subject Description Form

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| <b>Subject Code</b>                          | CSE40422                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Subject Title</b>                         | Infrastructure Management                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Credit Value</b>                          | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Level</b>                                 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Pre-requisites / Exclusions</b>           | Pre-requisites: CSE303 Construction Management I or CSE30303 Construction Management<br>Exclusions: CSE414 Construction Management II or CSE422 Infrastructure Management                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Objectives</b>                            | To provide students with basic knowledge related to the development and management of civil infrastructures. Students should be able to integrate the knowledge of civil engineering with consideration of practical management constraints, including feasibility study, life-cycle cost analysis, asset management, and performance of analysis and design within the environment, time, quality, and cost constraints.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Intended Learning Outcomes</b>            | Upon completion of the subject, students will be able to: <ul style="list-style-type: none"> <li>(i) Apply life-cycle management techniques to the management of modern civil infrastructures with considerations of constraints in fiscal requirements, time requirements, and quality standards;</li> <li>(ii) Apply contemporary construction management knowledge in project delivery systems, innovative contracting and financing methods to infrastructure project development;</li> <li>(iii) Apply analytical techniques for critically analyzing infrastructure management related data in a practical setting and using the data to make managerial decisions;</li> <li>(iv) Apply computer-based techniques including Building Information Modelling (BIM) for project management, optimization, and simulation to cope with the complexities and uncertainties in managing infrastructure projects;</li> <li>(v) Develop critical thinking, lateral thinking, and systematic thinking in perceiving, understanding and solving practical infrastructure management problems;</li> <li>(vi) Develop basic mathematical, statistical, and modeling skills needed for evaluating engineering and management alternatives subject to technological, economic, environmental, and social constraints.</li> </ul> |
| <b>Subject Synopsis/ Indicative Syllabus</b> | <ol style="list-style-type: none"> <li>1. Economic Appraisal of Projects (3 weeks)<br/>Annual equivalent costs and present worth; discount cash flow and internal rate of return; inflation and depreciation, comparison of multiple alternatives; project feasibility study.</li> <li>2. Decision Tools (2 weeks)<br/>Introduction to decision analysis tools such as AHP, ANP, goal programming, etc.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



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|                                      | <p><b>Students must pass the final examination and achieve a passing overall score/ grade to pass the subject.</b></p> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:<br/> Students will be assessed with two components: various assignments and a final examination at the end of the semester.<br/> During the course of this class, various assignments will be provided to assess students' learning outcomes of (i) to (vi).<br/> The examination will help students consolidate knowledge learned in lectures and tutorials and thus achieving intended learning outcomes of (i) to (vi).</p>                                                                                                                                                              |                        |
| <b>Student Study Effort Expected</b> | Class contact:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Average hours per week |
|                                      | ▪ Lectures / Tutorials                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3 Hrs.                 |
|                                      | Other student study effort:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
|                                      | ▪ Self Study                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 Hrs.                 |
|                                      | Total student study effort                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 9 Hrs.                 |
| <b>Reading List and References</b>   | <p>Textbooks:</p> <p>“Engineering Economic Analysis” by Donald G. Newnan, Ted G. Eschenbach, and Jerome P. Lavelle, Oxford University Press; 13<sup>th</sup> edition, 2017.</p> <p>“BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors,” by Rafael Sacks, Chuck Eastman, Ghang Lee, and Paul Teicholz, WILEY; 3<sup>rd</sup> edition, 2018.</p> <p>References:</p> <p>“Public Infrastructure Management: Tracking Assets and Increasing System Resiliency, ” by Frederick Bloetscher, 2019.</p> <p>Journal of Management in Engineering, American Society of Civil Engineers</p> <p>Journal of Construction Engineering and Management, American Society of Civil Engineers.</p> <p>Journal of Infrastructure Systems, American Society of Civil Engineers.</p> |                        |